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# SOIL CONSERVATION

Soil Conservation Service • U. S. Department of Agriculture

# SOIL CONSERVATION.

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**SOIL INSECTICIDES TESTED.**—In experiments to determine the effects of aldrin and dieldrin on soil micro-organisms and soil microbial processes. W. A. Ayers, P. A. Hahn, and O. N. Allen, University of Wisconsin bacteriologists, came to the conclusion that these soil insecticides don't harm beneficial soil-micro-organisms when they are used in normal amounts.

They started the experiments mainly to learn whether these insecticides had any effect on the populations of bacteria, streptomycetes, and fungi in the soil. They also investigated changes in the ability of these organisms to break down soil compounds to ammonia, to build nitrates from the ammonia, and to release carbon dioxide during the process. The tests were conducted on soils with different proportions of carbon and nitrogen.

At dosages of less than 10 pounds per acre, neither aldrin nor dieldrin was harmful; nitrification, ammonification, and carbon dioxide evolution progressed normally. Also, the different carbon-nitrogen ratios had no effect.

Editors are invited to reprint material originating in this magazine.



**FRONT COVER.**—An early winter scene near the top of a watershed in the Rocky Mountains of Colorado.

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# Cranberry Problems Solved

*Conservation planning helps cranberry farmers solve some of their numerous problems.*

By DARRELL R. SHEPHERD

ALL farmers have problems. So do cranberry farmers, whether running bogs in Massachusetts, New Jersey, Wisconsin, Oregon, or Washington. These bogmen get little rest in their fight against plain and fancy plant diseases, blights, fungi, worms, insects, mites, freezes, scalds, droughts, floods, soil decline, and price squeezes. Conservation planning, however, is helping them out of some of their worst doldrums.

The cranberry farmer's most important problem is water, in one way or another, according to Arnold C. Lane, chairman of the board of

supervisors of the Barnstable Soil Conservation District on Cape Cod, Mass. The district, with an assist from Soil Conservation Service technicians, has been helping cooperating farmers solve their soil and water problems. Lane is also an employee of the National Cranberry Association, which naturally has an interest in how well the growers do. He is a cranberry farmer himself and bought a rundown bog to see if he could bring it back into profitable production through conservation methods.

"The cranberry business depends mainly on water," Lane said. "We depend on water for irrigation. We depend on water for frost protection. And if we want to stay in business,

Note.—The author is work unit conservationist, Soil Conservation Service, Hyannis, Mass.



High producing cranberry bog with sprinkler irrigation system on Onni Niemi farm.



Onni Niemi (right) shows Darrell R. Shepherd of SCS how well his cranberries are doing in rebuilt bog.

we've got to be able to get water on and off our bogs quickly when we need to.

"The first thing to know is that you can get enough water over your bog whenever the cranberry plants need it, and that you can drain the water at least 2 feet down whenever you want to get the water off.

"To succeed as a cranberry grower, you have to have a properly built bog to start with," Lane pointed out. "If it isn't built right, it has to be rebuilt for good production."

"Then," he added, "the way to bring acre-yields up is to use water efficiently. That's where the Soil Conservation Service helps. It

has engineers, hydrologists, and other technicians who know how to design and lay out drainage and irrigation systems that can handle the job that needs to be done.

"Massachusetts cranberry growers have known about these water problems for a long time," he went on. "But they have lacked the technical and scientific knowledge needed to solve the problems. They did well enough when you consider that few of them had the necessary technical help. The main trouble has been that their ditches, flumes, and spillways have been too small."

That is being corrected as Soil Conservation Service technicians help cooperating farmers with their soil and water problems. The main technical problems involved are: (1) Constructing drainage outlets with proper size and grade; (2) constructing water control structures of proper size and materials; (3) getting rid of wet spots by open or tile drains; (4) laying out the right kind of border ditches; (5) building water-tight dikes; (6) holding the banks of dikes and canals in place with grass; (7) grading the bogs properly for complete surface drainage and for better and cheaper use of water; (8) finding water supplies; (9) designing water systems for both irrigation and frost protection; and (10) learning when and how much to irrigate according to the needs of the different kinds of soils in the bog.



Handscoping cranberries on the A. D. Makepeace farm.





Harvesting cranberries by machine on the farm of Dr. Harold Rowley.

The conservation program also includes planting the right kind of vegetation in odd areas around the bogs to help wildlife. In Plymouth and Barnstable Counties, shrub lespedeza is good for this purpose.

Onni Niemi is a Cape Cod cranberry grower who has shown what can be done with yields when you follow a conservation program.

Niemi has had his bogs since 1936, but under old-fashioned farming methods production had dropped very low. So in 1946 Niemi began to rebuild his bogs. He now has  $3\frac{1}{2}$  acres in production, and is remaking another  $1\frac{1}{2}$  acres.

In 1952, 3 acres produced 320 barrels of cranberries; in 1953, 466 barrels; in 1954, 350 barrels; and in 1955, a poor year all around, 258 barrels. That's a 4-year average of 116 barrels an acre. Massachusetts average is about 40 barrels an acre.

Niemi said that he gets the big yields mainly because he has a level bog with ditches big and good enough to do their job, and he can water and fertilize through his sprinkler system as needed.

A dugout pond can supply 60,000 gallons of

water a day. It refills in 24 hours. In 1953, when Niemi saw a bumper crop coming that needed an extra "shot in the arm," he pumped a nitrogen solution through his sprinkler system. Early in June he usually gives weak spots an extra broadcast of 7-7-7 fertilizer. Late in June he broadcasts 7-7-7 over the whole bog, 400 pounds to the acre.

In addition, Niemi controls weeds carefully by hand and chemicals. He maintains healthy vines to get more uprights, more berries. And keeps enough bees around to do a complete pollination job.

## A GRASSLAND FARMER

Norman Nellen, of the Carver County (Minn.) Soil Conservation District, has been secretary-treasurer of the district board of supervisors for 9 years, since the organization of the district. He was raised on a farm in Carver County and attended the Minnesota College of Agriculture where he majored in soils and agronomy. He is now operating a 145-acre farm in that locality.

Nellen is a firm believer in soil and water conservation. His wife, Mildred, who was born and raised in



Norman Nellen and family.



Bunker silo filled with grass silage on Nellen farm.

Minneapolis, is just as enthusiastic about soil and water conservation as is her husband. The Nellens are great believers in keeping the land in grass and in feeding more good forage and less concentrates to dairy cows.

As a matter of fact the entire 145 acres is in grass, and the herd of 34 Holsteins is fed mostly on good forage—pasture, hay, and grass silage. Norman's goal is high production of good forage from every acre of the farm.

The Nellens feel that their net income is just as high as it would be if they used a corn, grain, hay rotation. Norman also emphasized the fact that under his grassland farming system he is conserving soil and water in about the most effective way possible, and that the organic matter and fertility level of his soil is going up all the time. He also believes that low cost of production is an important factor in making a net profit.

Norman has seen the Carver County Soil Conservation District develop through the different stages since it was organized in 1946. He saw how at first only the leading farmers were willing to sign up and plan proper land use and soil conservation practices for their farms. Later on, other farmers became ready and willing to go into the program. At present almost one-third of the farmers are district cooperators.

Besides being very active as secretary-treasurer of the district board of supervisors, Norman is on the local school board, is a deacon in his church, is on the county American Dairy Association committee, and has served on the membership committee of the county Farm Bureau. He also pioneered in the use of long grass silage and in the "ration-a-day" system of grazing.

—A. B. FOSTER

**ANNUAL REPORT STATISTICS.**—During the fiscal year 1956, the Soil Conservation Service assisted 2,700 soil conservation districts, 33 more than during the previous year. Nearly 123,000 farmers and ranchers became district cooperators during the year. About 89,000 basic plans were developed. Soil surveys were completed on more than 31 million acres, while range site surveys were made on nearly 11 million acres.

## Shade Tobacco

By H. E. VAN ARSDALL and W. D. GRIFFIN

**M**ANY specialized crops present serious conservation problems. Farmers are often so intent on the high returns they get from crops that they fail to give adequate consideration to the land. Shade-grown tobacco in the Gadsden Soil Conservation District in Florida is an exception. Its profitable growth depends on a well balanced farming program.

This type of tobacco is grown from planting to harvest under shade. In the Gadsden District it is a \$9 million crop, representing two-thirds of the gross farm income. On the average farm only about 10 percent of the land is suitable for tobacco, so this acreage must be carefully conserved.

Soils where shade tobacco is grown must have high organic matter content for success-

Note.—The authors, both with Soil Conservation Service, are, respectively, management agronomist, Lake City, Fla., and work unit conservationist, Quincy, Fla.



Harvesting shade grown tobacco.



Cultivating tobacco grown under shade in the Gadsen Soil Conservation District.

ful production. Animal manure and residues from both native vegetation and green manure crops are used to keep these soils in a highly productive state. About 10 tons of animal manure per acre is applied on the 4,500 acres of shade tobacco grown in the district each year.

Steer feeding to provide manure for tobacco land started about 30 years ago. This enterprise has grown to such an extent that last year 12,000 steers were marketed from feed lots in the district. The production of manure amounts to about 36,000 tons annually.

The common cocklebur is one of the unusual crops used for green manure. Its resistance to rootknot and its rapid growth make it especially desirable. Within a few weeks after tobacco harvest in July this weed is 3 to 4 feet tall in the "shade," and provides land protection and a large volume of potential green manure.

Highly fertilized small grain is the usual winter cover crop. It is neither grazed nor harvested, the total growth being turned under as green manure. Many district cooperators follow a 2-year rotation of corn and tobacco. Corn yields average 80 bushels per acre, while 100 bushel yields are not uncommon, indicating a high state of soil fertility.

When the district was organized in 1941, soil loss from tobacco lands was heavy. Ter-

aces were needed, and a modified broadbase terrace was developed. It was designed to permit sufficiently rapid discharge of water to prevent plant scalding. Water disposal areas were developed by planting Bahia grass waterways.

Irrigation was being used on about 10 percent of the tobacco land when the district was organized. Today, 90 to 95 percent of the crop is irrigated, largely by water from ponds designed by Soil Conservation Service personnel working in the district. Maxwell Strom, a supervisor of the district since its organization, estimates this practice has increased the value of tobacco by 40 percent and has been of considerable value to other crops.

Pasture development was greatly needed when the district was organized. The increase from 3,000 acres in 1941 to 25,000 acres today, shows the importance of this conservation measure that fits in so well with tobacco production. Most of the pasture has been developed on land unsuited for cultivation.

Thus, conservation measures such as terracing, water disposal, pasture development, green manuring, farm ponds, irrigation, and good land use that the district has been promoting have supplemented the specialized production of shade tobacco. Conversely, the production of tobacco on the valuable lands of the district has encouraged a sound conservation program.

# Across The Sea To Success

*A 15-year-old immigrant boy becomes a leading conservation farmer within 35 years.*

By A. B. FOSTER

**I**N 1921, Carl Gobrecht, a fifteen-year-old lad, traveled alone from Germany to America to start a new life in the New World. His father, a forester near Hanover, Germany, had told the boy there was no future for him in his homeland.

Carl Gobrecht now owns 2 farms in Lafayette County, Wis.,—the 160 acres where he lives and raised his family, and a 200-acre neighboring farm bought in 1954 where his son, Dick, now lives.

Carl is president of the Mound Branch Watershed Association, an organization he helped his neighbors get started. He is a member of the Soil Conservation Society of America. He was awarded a plaque as the outstanding farmer from his area in 1948. In 1951, he won a trip to Beltsville, Md., after winning the county and area grassland contest. In 1952, he won the county corn yield contest with a plot average of 178 bushels per acre.

Note.—The author is information specialist, Soil Conservation Service, Milwaukee, Wis.



Mr. and Mrs. Carl Gobrecht.

In the spring of 1954, Carl sponsored and conducted a private soil conservation field day on the 200-acre farm he had just bought. Soil Conservation Service men from three counties helped lay out strips, a pond, and waterways, in addition to the overall conservation plan. Between 500 and 600 people attended the field day and saw pasture renovations, pond construction, tree planting, a waterway constructed and seeded, anhydrous ammonia and lime applied, and other conservation practices.

When Carl first landed in America he went to work for his brother Fritz, who had come to the United States earlier and was farming in Lafayette County. He later worked for neighboring farmers. During one winter things were so tough he worked without wages in order to have a place to stay.

By carefully managing his finances Carl got enough capital together to rent a farm. It was about this time that he asked Elva Kinch, an attractive rural school teacher, to become his life partner. "My success was assured when she agreed," Carl says.

The 160-acre farm where the Gobrechts now live was not a strange farm to Carl when he bought it in 1941. In fact, he had lived near the farm and had watched its decline since he came to the neighborhood as a boy.

"This farm was a garden of Eden when I first saw it in 1921," Carl says. "Corn yields were 70 to 80 bushels per acre. Other crops yielded as high in proportion. But, during the twenties and thirties the farm deteriorated until erosion and overcropping had reduced it to a wornout, gullied waste. There were three large gullies on the farm and a lot of sheet erosion and shoestring gullies. The buildings were completely shot.

Having lived near the farm all this time, and knowing what the land had been like, Carl was convinced that it could be built back.





Carl Gobrecht harvesting grain on a stripcropped field.

Against the advice of many people familiar with the place, he negotiated a Farm Security tenant purchase contract and bought the farm in 1941.

Carl called on Bruno Zucollo, local Soil Conservation Service technician, even before he moved on the farm. They worked out a soil conservation plan. The first thing Carl did was to take out all the fences. Contour strips were laid out and a 5-year crop rotation of corn-oats and 3 years of alfalfa-brome was started. During the first 3 years he put on 300 tons of limestone. He worked out a fertilizer program from soil tests made by the Wisconsin College of Agriculture. The corn is fertilized at planting time with 125 to 150 pounds of 5-20-20 as a starter. It is later side-dressed with 125 to 200 pounds of ammonium nitrate, depending on the need as shown by tests. Oats are fertilized according to test. Second and third year meadow is given 200 pounds of 0-9-27.

Gobrecht thinks that many people do not apply fertilizer to fit the needs of the land.

He feels that the heavy crops of organic matter resulting from rotation make heavier application of nitrogen necessary to feed the bacteria that break down this humus.

He does not rush through his farming operations but believes in taking his time and doing a good job. For example, he uses a field cultivator before plowing so that he can work the sod deeply into the soil before plowing. This makes more water soak into the soil, prevents the soil from sealing over, and provides for better capillary action in reverse during dry seasons.

Carl says he is convinced that a lot of people don't get the results they should from conservation practices like contouring and terracing because they don't pay enough heed to soil tilth. "You've got to have water-holding capacity in your soil in order to make contouring work, for example," he points out. "Soil management has to come before mechanical practices."

(Continued on page 120)

# When The Bluestems Fade Away

By KENNETH T. SHERRILL

NATURE plays no favorites. She may adjust herself to man's activities, but in so doing she uses her own devices and quite often man must suffer the consequences.

Take the case of pastures in the Pottawatomie County (Kans.) Soil Conservation District. Pottawatomie County is in the northern end of the bluestem, or Flint Hill, pasture country. Originally this was some of the best native pastureland of the Nation. Sixty percent of the farmland in the county is still classified as pasture. The bluestems and other tall grasses vie with each other for dominance. Monarchs through centuries of foul and fair weather, they have reigned supreme, crowding out most other forms of plant life. Grazed by the buffalo, seared by prairie fires, parched by sun and drought, they still laid down their green carpets each spring.

Civilized man and his influence over the last hundred years plus the hazards of weather have changed the native grass pastures in

Pottawatomie County, as in other counties of the bluestem region. The condition of many native pastures has gone down from good to fair and then to poor. Some of them can no longer be dignified by being called native grass. Some of them can no longer be recognized as pastures.

Pastures that at one time were in excellent condition now have practically everything in them but the "big four"—switchgrass, Indian grass, big bluestem, and little bluestem. These grasses are the ones that really produce the pounds of beef, which here is the desired end product of all grass.

Now taking the place of the tall grasses are the short perennials, such as bluegrama and buffalograss—grasses that are good in areas of lower rainfall, but out of place in the bluestem belt. But, in many pastures the shorter grasses, too, have had difficulty in surviving.

Continued abuse under unfavorable circumstances gives Nature's pride another blow. To fill the void left by these grasses, she pushes forward an invading horde of weeds, brush, and annual grasses—coralberry, sumac, ironweed, ragweed, cheatgrass, little barley—the scalawags of the native pasturelands.

Under poor grass management, the "big four" have been sacrificed and replaced by the short grasses and the annual grasses and weeds. What has brought this about? Grass, like all other plants, must manufacture its own food. It must supply its own needs and lay up some reserve in its roots if it is to continue to survive and furnish forage for livestock. Continually grazed short, it cannot do this and weakens and dies. Native grasses can fight the effects of drought and heavy grazing for a year and come back. But 2, 3, and 4 years of drought, plus overgrazing, causes the plants to lose their vigor and the sod begins to thin out. Other plants less productive for livestock begin to come in. Grazed even more closely, the tall

Note.—The author is work unit conservationist, Soil Conservation Service, Westmoreland, Kans.



Buckbrush and sumac on overgrazed pasture in Pottawatomie County, Kans.



Yearling cattle in one of the bluestem pastures of Mitchell Tessororf.

and short grasses give way to the annual grasses. Then, unpalatable weeds and brush rush in to take their places. Drought? Fire? Brush? Yes! But, still essentially a matter of too many livestock in the wrong place at the wrong time. This is why that 60 percent of the pastures in Pottawatomie County are now classified as fair to poor in condition.

As a contrast to these pastures in rundown condition, let's take a look at one of the better pastures. Among the pastures which might be rated excellent is that of Mitchell Tessororf of Onaga, Kans. This 320-acre pasture has been in the family for many years. Tessororf and his son, Don, have had control of the pasture since 1938. There is no brush in the pasture and the native grasses are giving good to excellent coverage.

Tessororf, former supervisor of the Pottawatomie County Soil Conservation District, stocks this pasture with approximately a hundred head of yearling steers each year. When he was asked how his pasture had been maintained in its present condition and kept free of brush, Tessororf hesitated in his answer. Proper rate of stocking and distribution of grazing appeared to have a lot to do with it. Mowing and the location of water and salt had helped in getting uniformity in grazing.

Did he think that the location of salt was important? "Oh, yes, I sure do." Salt had been used to attract the cattle over to the southwest corner of the pasture where grazing had been light. Mowing of certain areas had also helped to get more uniformity of grazing.

Had burning been practiced? "Well, only occasionally. We probably haven't burned the pasture more than once in 10 years." He was then asked if he thought his pasture was better than the average in this area. "Well, it must be for it is assessed at a higher rate."

Perhaps your pasture is one of the 6 out of 10 pastures in Pottawatomie County at which a second look must be taken to determine if it should be called a pasture. Or perhaps you have a poor pasture in some other area of the Bluestem Hills. If so, Soil Conservation Service technicians believe you should consider doing one, or several, of the following:

1. Provide supplementary pasture or feed so your cattle will not have to be turned out too early in the spring or need to stay on the pasture too long in the fall.

2. Be prepared to reduce the number of animal units on the pasture as a series of dry years come.

3. Consider pasture spraying not as a panacea for all of your pasture ills. Brush and weeds are indicators of a poorly managed pasture. Better leave them in there unless you have recognized their cause and are prepared to follow their removal with some of the pasture management practices that will prevent their return.

4. Question the practice of burning. Know that it has very little value as far as the control of brush and weeds are concerned, and that it does result in increased moisture losses and less forage production. Burning may result in a yearly loss of from 1,000 to 1,200 pounds per acre.

# College Training for Soil Conservation

By WAYNE H. SCHOLTES

IOWA STATE COLLEGE is developing new methods in the field of soil conservation training. Two courses in agronomy, soil survey, and soil conservation are probably unique in the type of equipment and materials used. They were developed mainly by the author.

Intensive training of students in these courses required a large investment in new equipment, but this cost will be spread over a long period. The expenditure is making it possible to demonstrate many principles with modern precision instruments.

The main purpose of the soil survey courses is to acquaint students with the basic principles of soil formation and the field identification and

mapping of soils. Primary emphasis is placed on the relationship of Pleistocene geology to soil formation. Characteristics of soil parent materials and their influence on soil development are stressed. Geomorphology is covered in detail and the students observe three-dimensional projections of the topography made from field sheet photos in each of the major soil associations in Iowa.

The students attend lectures and prepare in the laboratory a set of interpretive maps from field sheets. Each student has a different field sheet showing soil, slope, and erosion on an aerial photo. From the field sheet data the student prepares a parent materials map, corn suitability map, erosion hazard map, and a land use capability map.

Note.—The author is professor of soils, agronomy department, Iowa State College, Ames, Iowa.



Students listening to a discussion on land features by SCS conservationist.





Professor Scholtes and student checking farm plan of student.

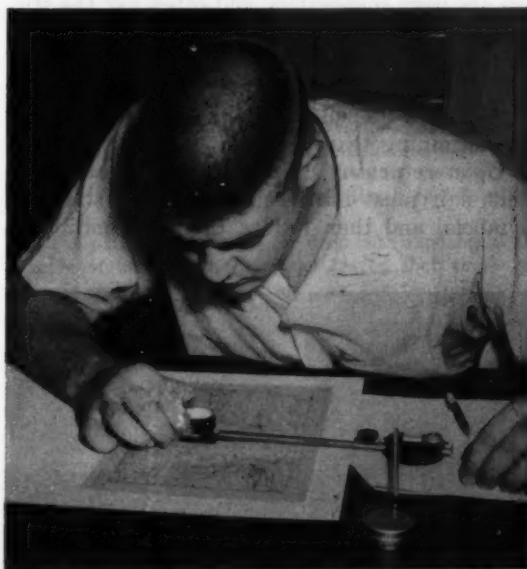
In conjunction with classroom study the students prepare, in the laboratory, a topographic map from individual stereoscopic photographs. Major slope breaks are mapped and the type of parent materials that would be found in such areas are recorded. Each student has a magnifying mirror stereoscope at his disposal. To familiarize each student with map measurement he must also measure the different areas on his map by use of the optical planimeter. In addition, a pair of air photos with the major land forms already identified are placed under a pair of scanner stereoscopes which are alined back to back. The instructor can view the topography in three dimensions with the student on the same photo pair and advise on any questions.



Students mapping geomorphological features through use of mirror stereoscopes and three-dimension viewing.

The next phase is intensive study of the soils in the surrounding area. Each student makes a complete set of miniature monoliths of the soils from soil pits dug in the field. The miniature monoliths are mounted, labeled, and sprayed with vinylite. After the monoliths have been treated, students make detailed profile descriptions utilizing Munsell color books and high power binocular microscopes for observation of structural characteristics.

At this point enough material has been used in classroom lectures on soil genesis that the first of two major field trips is scheduled. Each field trip covers about 700 miles. Travel is by charter bus, paid for by the students, and covers about half of the major soil associations in the State. Standard equipment is a portable sound



Student measuring map areas with optical planimeter.

system for discussion enroute, portable black-board, spades, augers, and sample-sacks. Major profiles are sampled to illustrate the topo, chrono, geo, and bio sequences encountered in the field. At the end of the trip the samples are laid out, comparisons made, and the significant information summarized.

The second field trip is taken later, and the relationships, mapped earlier in the laboratory by the geomorphology, soil parent materials, and soil types, are studied and checked in the field.

Field trips are scheduled on weekends so that there is minimum disruption to the students' other classes.

The lecture and laboratory work culminates in a field mapping problem. A mapping legend is worked out in class to show soil, slope, and erosion. Each pair of students is supplied with field equipment and assigned a half section of land within 15 miles of the college. The air photo is on a larger scale than the field sheets to make possible detailed identification and recording of the soils. The photos for several flight lines are available to the students and they must determine the location of their tract and how to get there. Each student pair must contact owners of the tract, explain its mission and obtain permission to map the area. Farmers are very cooperative and often ask the students to check back with them on completion of the map so that they can learn more about the soils on their farms. Each team of students must match its soil boundaries in the field with the adjoining team.

Upon returning to the laboratory each student pair must ink its map, utilizing standard symbols, and then reduce this information to



Student reducing field sheet map with overhead projector.



Students observe land forms on maps with scanner stereoscopes.

a publication-sized map. Maps are reduced in the overhead projectors to one-sixteenth of their former size. This necessitates elimination of many small areas and many combinations. These must be noted and reasons for all changes given.

The amount of work, study, and travel required for this course is much greater, in the students' opinion, than in any other course for which the same or more credit is allowed. However, its popularity is indicated by the fact that the course, which is elective, is always filled to capacity and has a sizable waiting list.

After the course in soil survey and classification, the soil conservation course follows in logical sequence. As with the classification course, a great deal of emphasis is placed on application of principles to actual field situations. The objective is the development of a workable farm plan with emphasis on maximum returns over the years.

Soil erosion is dealt with throughout the course on the basis of (1) what it is, (2) where it has occurred, (3) when it takes place, (4) why it has happened, (5) how serious it is, and (6) what can be done to control it. Bulletins, reprints of research papers, and experiment station reports are the main sources of data from which conclusions are reached.

In the laboratory the construction of contour maps from bench mark data is the first step in acquainting students with map construction. This is followed by laying out contour lines and making a topographic map. Next a bus is chartered for a 700-mile trip to a portion of the State where students can observe soil conservation in operation.

The soil conservation experimental farm near Clarinda, Iowa, where much of the original erosion data was obtained, is visited first. Students can observe the physical layout of the farm and discuss the results. From there the group goes to the Page County Soil Conservation District, where there is a full afternoon program under the direction of the Soil Conservation Service work unit conservationist. In this district the students visit farms where they see actual practices being applied to the land. The next day the group goes to northwest Iowa to see many conservation practices on two State experiment farms. The last afternoon on the trip is spent visiting some of the watershed flood control areas of the Little Sioux watershed. They see practices completed early in the program, and also those recently completed, and some in the process of construction.

By this time the students are ready to begin their farm plans. Three months before each quarter the instructor meets with Howard Oak, the SCS work unit conservationist in the Marshall County Soil Conservation District, to select a farm. Soil maps are studied and one is selected that has a variety of soil problems. A farm is chosen on which the operator has not applied for a plan, but the farm has not yet been planned. The photo with the soil map is enlarged and reproduced and each student furnished a copy. In addition, soil test results are given for the farm. Students may work in pairs or individually on their term problems, which require the following: (1) Land use capability map, (2) erosion control practices map, (3) field layout and erosion control map, (4) fertilizer and lime program, (5) livestock program, (6) an estimate of production after farm plan is in operation, (7) total costs of the program, (8) estimated net annual income after the plan is in operation.

The group then meets with the farmer and Howard Oak. After a group discussion, the class walks over the entire farm, noting the condition of fences, physical layout, ridge divides and slope breaks for length of slope calculations, and checking the soil map for all drainageways.

The completion of the farm plan is a very time consuming and arduous job. However, the students place a great deal of value on this

training and think it is of great practical value. Some of the better plans are sent back to Oak, as the farmers are interested in seeing how the plans have worked out. It is interesting to note that the eventual farm plan made by the farmer with the planner's help is often similar to, or identical to, those made by the students.

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**LAND LEVELING PAYS.**—Land leveling has increased the cotton yield 20 percent, cut irrigation time in half, and reduced irrigation labor two-thirds for A. L. Everett, who lives 6 miles southeast of Portales, N. Mex.

Before Everett's north field was leveled in the spring of 1955, there was excessive side fall in the land. He had to be working at irrigating all the time and used his shovel most of the time.

As Everett had been a cooperator with the Roosevelt Soil Conservation District since 1950, he took his irrigation problem to Soil Conservation Service technicians in the Portales office. The field was staked, surveyed, and after the various leveling designs were studied, it was decided to level the entire field to a uniform grade.

The plan chosen called for deep cuts exposing 2 or 3 acres of raw caliche. It was feared that these cuts would reduce the total crop yield for the field, which was almost 1½ bales of cotton to an acre in 1954.

After Everett decided to level the field he spent \$1,700 on the 16-acre field, or \$106 per acre. He moved 10,650 cubic yards of soil and spread 160 tons of barnyard manure over the area where deep cuts were made.

The advantages of leveled land were soon apparent. Everett found he could irrigate 5 or 6 acres a day, where before he could irrigate only 3. He could set the water and do other farm work in the vicinity. Before leveling he could not leave the field while irrigating.

Although this saving of water, pumping costs, and labor was significant, the real payoff came in the fall when 11 acres of the field planted to cotton was harvested. In 1954, one of the best cotton years Portales has known, the field produced 680 pounds of lint to the acre. In 1955, Everett ginned 801 pounds per acre on the newly-leveled field. The cotton was sold for 31 cents a pound. This meant that about \$37.50 an acre was made due to more efficient irrigation. At this rate the total cost of leveling and fertilizing can be repaid in 3 years through increased crop yields alone.

When you consider the saving of water, saving in pumping costs, reduction in labor, increased crop yields, and the increased value of the farm property, it isn't difficult to understand why Everett is well pleased with the leveling and fertilizing practices on his farm.

—M. C. WILLIAMS

# A Tireless Worker

By H. E. WALDROP

**I**N erosion-riddled Louisa County, Va., Russell (Russ) Fisher is trying to show others the way in conservation farming.

Severe erosion has been going on in the county for more than 300 years. If any county in the United States has suffered more total erosion, Fisher says he would like to know about it.

Crop yields dropped so low in Louisa County that around the turn of the century a call went to Washington, D. C., for help. The Department of Agriculture sent Hugh H. Bennett, then a soil surveyor, to investigate. He found that erosion was the main trouble.

No organized effort was made to combat erosion in Louisa County, however, for the next 30 years. Then, in 1939 Russ Fisher and a group of his neighbors organized the Thomas Jefferson Soil Conservation District. Carl Andrews, county agent, did most of the educational and leg work. District Agent Jim Quisenberry and other Extension people helped him.

Note.—The author is work unit conservationist, Soil Conservation Service, Louisa, Va.

The farmers of Louisa County elected Russ Fisher as their supervisor of the 3-county soil conservation district. The supervisors elected him chairman of the board. He has held that post since.

Russ runs a 1,000-acre grade-A dairy farm with his brother, C. F. Fisher, and their sons. The farm is located near Gordonsville.

Russ Fisher cultivates 300 acres in contour strips. He uses a 4-year rotation of corn, small grain, and 2 years of hay. Sod waterways protect depressions, furnish hay, and serve as roadways.

Corn yields of more than 100 bushels an acre are not unusual. Russ says that conservation farming has played its part in these high yields. Fifty years ago Bennett found that yields of 8 to 10 bushels an acre were average, while many yields were less.

By other good practices, before starting conservation farming, Russ had increased his average corn yields up to nearly 38 bushels per acre. The yields were above county and state averages in 1939 when Russ started level farm-



Part of the cattle herd graze near a pond on the Russ Fisher farm. Wild geese nest in the rushes on the far side of the pond.





Russ Fisher cultivating corn. The contour multiflora rose fence, in background, separates field from pasture.

ing to conserve water and fertility. Now he can sleep contentedly on dry or rainy nights, knowing that his soil will still be there for him and others to use again.

About 400 acres of improved pasture are yielding more and better grazing. Although the cows and sheep get some grazing all year, other forage has to be added for about 3 months each winter. This feeding period is about 4 to 6 weeks less now than it used to be. Each cow now averages 4 gallons of milk daily. The average used to be 3 gallons daily. In spite of this increased demand on pasture and meadow production, the number of dairy cattle has been increased 24 percent. And 25 beef cows have been added. Concentrates are bought to supplement the homegrown grains, hay, and silage. More than half of the 400 acres are now in native bluegrass, the rest has been seeded to orchardgrass, Kentucky 31 fescue, and ladino clover, or high producing annuals, such as sudangrass and rye.

Fisher finds that for top production an improved pasture must have: (1) Enough lime and fertilizer to satisfy plant needs; (2) annual clipping to keep weeds down; (3) rotated grazing to avoid overgrazing; and (4) seeding, on the contour where needed, to control erosion on long slopes.

Russ finds that his soils need about 2 tons

of lime per acre when he starts treatment. Also, about 1,000 pounds of complete fertilizer to supply the phosphorous and other minerals sold in the milk and used in making the bones of growing animals. He has found that he needs to add about half these amounts of lime and fertilizer each 2 or 3 years after the initial applications.

About 300 acres of woodland produce timber. Russ farms his woodland as carefully as his pasture. He has removed or killed defective trees and trees of poor species. He has planted seedlings in places where they have room to grow. He harvests timber on a selective basis: he cuts mature trees as needed, and leaves the young and thrifty trees to continue growing. He can harvest trees annually as a crop. By selective cutting he can remove from each acre annually about \$25 to \$35 worth of yellow pine logs on a sustained yield basis. Actually, of course, he finds it more convenient to harvest the trees by selective cutting about one-tenth of the woodland once every 10 years. Russ has been named "tree farmer" by Virginia Forests, Inc.



Fisher marking trees that are ready for harvest.



Hay harvest on the Fisher farm.

Russ Fisher has graded and seeded all old gullies on the 1,000-acre farm. He has installed tile drains in some wet areas. In other areas open ditches drain off excess water.

He has built four farm ponds. They furnish fresh, clear water for his cows. They also provide fish for his table, fire protection for his buildings, and recreation for the family. Wild ducks by the hundreds now use the ponds as a refuge.

Plantings for wildlife food and cover are many and varied. Wild geese now breed right on the Fisher farm. Russ has seen them nesting on the edge of two of his ponds. But, with his usual modesty, he gives most of the credit to his neighbor, Carl Nolting, who is quite an expert on wildlife.

Rus has removed, relocated, or rebuilt his fences to fit the conservation pattern of his farm. He uses multiflora rose hedges as fences and for wildlife cover. They also add to the scenic beauty of the farm. He thinks the rose fences protect wildlife from stray dogs and other predators.

Fisher has also planted wildlife seed plots to furnish seed free for his neighbors to use. He says: "I used to think ditchbanks and fence rows looked better cleaned up, but now I think they have more value as shelter and food

sources for birds and other wildlife." As a result, Russ figures the number of quail has doubled and rabbits are about 3 times as plentiful. He thinks deer have increased to at least 10 times as many as there were with his old system of farming. He gives credit to the Virginia Game Commission for much of these increases.

All this is a result of the vision Russ had of a better way of farming 17 years ago. His farm today is the fulfillment of a conservation plan he worked out with Soil Conservation Service technicians through the Thomas Jefferson Soil Conservation District, which he heads.

In addition to his farm and district duties, Russ is now a director for the Southeastern States in the National Association of Soil Conservation Districts. He's kept on the go, frequently to the Nation's Capital, to North Carolina, to other sections of Virginia, to the Deep South, to Boston for the week's national convention, or wherever duty calls.

Russ Fisher—tireless worker for soil and water conservation and practical conservation farmer.

*There's no better Christmas gift than a subscription to this magazine.*

# Fifty Years Later

**A Douglas-fir plantation sells for \$750 per acre 50 years after it was burned over.**

By WILLIAM J. SAUERWEIN

**W**HEN Julius Mommsen transplanted wild Douglas-fir seedlings on his burned over timberland near McCleary, Wash., after the "dark day" burn of 1902, he probably did not realize how profitable it would be. Neither did his sons or his neighbors. After all, wasn't there enough timber to last forever? But, Julius undoubtedly had in mind a legacy for his 13 children.

One by one the children grew up and left the place, and old Julius died at the age of 81 in 1935, his ashes scattered through the beloved forest he had nurtured. Only John, the oldest boy, stayed on to run the 770-acre farm, 700 acres of which was by then thriving Douglas-fir and alder forest. The fir plantation was doing fine and needed little attention. Just keep fire out and let it grow was John's motto. He reneged a little during the early part of World War II, because the Nation needed long, straight Douglas-fir piling and Mommsens had them. He cut a few to help the cause.

Then in 1949 Henry Mommsen came home after 30 years of Alaska railroading. He and John started intensive management of the woods by first thinning 40 acres of Douglas-fir with the help and assistance of the local Soil Conservation Service men. That year the Port Blakely Mill Co., offered to buy out the Mommsens for \$54,000. John and Henry thought it was a lot of money, but they didn't need it, and they were having fun. They just kept on thinning and harvesting their timber.

The local SCS men encouraged them to thin and prune their 1931 plantation, then 23 years old. By 1955 the Mommsens had developed

roads and trails through the whole area, and thinned about 200 acres. That fall they got another offer, this time for more than \$200,000. Henry and John said they'd think about it, but after talking it over decided to keep the forest.

Then on Friday, April 13, 1956 *"The Oregonian"* of Portland carried this headline, "300 Acres Sold in Timber Deal." The story continued: "John and Henry Mommsen of McCleary, have sold 300 acres of the more than 800 acres they own to the Puget Sound Plywood Corporation of Tacoma for \$224,000. Until this sale, only selective logging has been done on the Mommsen tree farmlands, and most of it by the Mommsens themselves. Thousands of seedling have been set out over the years."

Imagine! Almost \$750 per acre for timber only half a century old!



Mommsen brothers tree farm near McCleary, Wash., (above) as it looked in 1910, (below) as it looked in 1950.



Note.—The author is woodland conservationist, Soil Conservation Service, Albany, Oreg.

## DISTRICT PROFILE

HAROLD S. WRIGHT  
of  
NEW YORK

**H**AROLD S. WRIGHT of Pawling, N. Y., is surrounded by eminent people. Joining his Quaker Hill farm to the east is the estate of Lowell Thomas, to the south is former Governor Thomas E. Dewey, while Edward R. Murrow owns a farm nearby.

But Harold Wright is becoming a celebrity too, through his interest and activities in soil and water conservation. He is serving his second term as president of the New York State Association of Soil Conservation District Directors.

Wright has been instrumental in getting a request before the State Legislature to establish a subcommittee to study water rights legislation. He is 1 of 2 men representing agriculture on the subcommittee making a study of water use, water rights, and needed legislation that will affect all phases of the State's economy. Recently, he was appointed to a special legislative committee to study irrigation and water needs.

At the 1956 National Association of Soil



Harold S. Wright.

Conservation Districts Wright was elected Area I vice president. He was recently made chairman of the national association's publicity committee.

Harold Wright was educated in New York public schools. He studied agriculture at Colorado State College. He was manager of Sheffield Farms near Pawling for 25 years before buying his own farm on Quaker Hill in 1946.

While on the Sheffield Farms he came face to face with erosion problems. He noticed that a farm pond, used for harvesting ice, silted up from the hillsides above. After observing the effects of erosion for several years, and cleaning silt out of the pond, Wright decided it was time to do something about it. In 1938, he went to Art Williams, assistant agricultural agent in Dutchess County, who advised farming the land in contour strips. Some of the first contour strips in the county were laid out on Sheffield Farm that year. It was then that Wright became fully aware of the value and need of coordinated soil and water conservation measures.

When the Dutchess County Soil Conservation District was formed in 1946, Wright was one of the first farmers to request technical help. With Soil Conservation Service technicians, he devised a coordinated soil conservation plan. He has since established diversion ditches, contour stripcropping, wildlife hedges, crop rotations, rotation pastures, and tile drainage on his farm. He has reforested his wood areas. He reports that a coordinated conservation plan pays off handsomely in increased yields.

Wright has been a director of the Dutchess County Soil Conservation District since it was organized. He served as chairman for several years and is now district treasurer. Among his colleagues on the board of directors he is known as a man with new ideas and one who cuts through red tape to get things done.

Most farmers are busy on the farm trying to make ends meet, and Wright is no exception. Besides operating his own farm of 85 acres and 120 rented acres, he is building a new pole barn to replace the dairy barn that fire destroyed last winter. Despite all this farm work, Harold Wright still devotes a great deal of time to his soil conservation district and his state and national associations.

—HAROLD E. KLINGAMAN



# Land Use Changes in the Southeast

By J. B. EARLE

ONE of the most significant agricultural developments of recent years is that of land use changes in the Southeast.

T. S. Buie, state conservationist for the Soil Conservation Service in South Carolina, sums it up this way: "A new crop has come to the South. Grass, once despised by Southern farmers as a devouring enemy, and fought by them from dawn to dusk, is now challenging cotton as the leading crop all the way from the Carolinas to Texas."

In 1926 the 9 Southern States east of Texas (Mississippi, Alabama, Georgia, South Carolina, North Carolina, Tennessee, Louisiana, Virginia, and Florida) planted 19,321,000 acres of cotton. Thirty years later the acreage in these same 9 States was down to 6,013,499. During the period 1925 to 1950, the area devoted to pasture and hay in the 9 States increased from 31,381,885 to 64,890,247 acres.

Note.—The author is area conservationist, Soil Conservation Service, Chester, S. C.



A typical grassland scene in Fairfield County, S. C.

Yes, land use has changed from cotton to grass and also to trees. Sixty-four percent of the land area of the Southeast is in forest. Commercial forest, excluding unproductive and reserved land, amounts to 91.6 million acres, an increase of 6 million acres since 1945. Most of this is accounted for by the abandonment of farmland. Farmers are, by far, the leading class of woodland owners, with nearly 55 million acres, about 60 percent of all the commercial forest.



R. H. Musser and S. D. Cathcart look at a thriving plantation of pines.

Some especially striking changes have taken place in agriculture in South Carolina during the past generation. For example, the peak in cotton acreage in South Carolina was in 1918 when slightly more than 2,750,000 acres were planted. The acreage in 1956 is about 726,000. The rate of change has been especially rapid during the past two decades.

The big changes have been from mules, manpower, row crops, and erosion to mechanization, electrification, grass crops, reforestation, diversification, and soil and water conservation.

Some of the factors contributing to the changes were: (1) Erosion was excessive when cotton was grown on land unsuited for row crops. (2) Research provided farmers with new grasses and legumes and more scientific methods of farming. (3) Agricultural agencies and farm leaders urged diversification, reforestation, increased fertilization, and conservation. (4) Increased industrialization in the South drew labor from the farm. (5) More and better

mechanical appliances were produced and distributed. (6) Demand for wood products increased. (7) Cotton and some other crops were overproduced and surpluses resulted in making acreage controls necessary.

The big change to conservation farming began in the thirties. Giving impetus to the change was the organization of soil conservation districts.

One of the best ways to grasp the significance of the changes in the South is to take a look at one former plantation where typical changes have come about. For example, on the Dave Crosby place in the Fairfield Soil Conservation District, loblolly pine is king, where once cotton reigned supreme.

At one time Crosby owned 3,000 acres of land, and in 1920 produced 750 bales of cotton, according to his grandson, John S. Stone of Chester, S. C. Now, only about 107 acres of cotton

are planted. This is grown by six landowners who have purchased portions of the original estate.

When Crosby died the estate was split up. The original 3,000 acres is now owned by 8 farmers and a paper company.

The old Crosby Institute, the boarding house for the school, and cotton used to be the main features of this plantation. The institute building, the old boarding house, and a small acreage of cotton remain, but the changes that have come about are many.

Ed Davis, who has been farming some of the land since 1905 said, "People and cotton have been leaving during the last 50 years." Ed's 11 children are all gone except 2 who live nearby. They both work with pulpwood.

John S. Stone of Chester said, "As late as 1940 there were 200 people living on the Crosby tract of land. There are less than half that number living there now."

Except for the 107 acres of cotton now being grown and a small acreage of corn and small grain, the rest of the land is in pines, pastures, or idle. The amount of idle land is small and is fast being restocked naturally with pines.

There is one dairy farm on land formerly owned by Crosby. It is owned by J. O. Coleman. The 622-acre tract that he owns is used as follows: Pasture, 100 acres; cotton, 15 acres; corn, 20 acres; small grain, 45 acres; trees, 442 acres. Coleman also has four stock watering ponds that he built with technical help from the Soil Conservation Service.

His woods resulted from natural reforestation. He protects them from fire and thins selectively. A 15- to 20-acre field that was in cultivation about 20 years ago is now in pines. It was thinned recently and the pulpwood brought \$327.50. Mr. Coleman said, "There is at least four times as much pulpwood left in the stand as was removed. Then, too, the value will increase faster during the next 20 years than during the past 20."

"This part of the Fairfield County Soil Conservation District is better suited for pines or grass than anything else. There was a time when the situation called for cotton, but now pines and pastures are proper," he said.

Coleman says some of the reasons for the changes coming about are: (1) Some fields eroded so badly cotton could no longer be pro-



Eroded field on the Dave Crosby place in Fairfield County, S. C.



Remains of the "Old Boarding House" on the Dave Crosby Place.



Left to right, M. R. Frierson, George B. Hagood, and R. Y. Palmer examine some pine seedlings that will soon be planted in Fairfield County.

duced; (2) the hilly land is not well adapted to use of machinery; (3) when this type of soil is clean tilled it can't do anything but wash away; (4) we couldn't compete with other sections in producing cotton; and (5) more industry came into the area and drew labor away from the farms.

He also said, "The changes were good for the people and the land. The people now have more income. The land is better protected. I predict that there won't be any cotton on this tract of land in one more generation."

Erosion and time cause land and homes to deteriorate unless properly maintained and conserved. The old boarding house on the Crosby tract of land is falling apart, but, thanks to pines and pastures, the land is being reclaimed and its strength renewed. A few more acres each year come under the powerful influence of young pine seedlings growing out of seed blown in naturally from nearby loblolly pines. This is proof that when given a chance, nature revegetates the land and heals over manmade scars.

Pastures and pines will never entirely replace cotton in the South. But they will fit together with cotton in a complementary relationship based on economic conditions, the capabilities of the land, the desires and abilities of the farmers, and related factors. There is plenty of land on which we can grow all of the cotton we need and still have millions of acres left for pastures and pines.

#### CONSERVATION TOUR FOR BIOLOGY STUDENTS.

—In May 1956, Limestone College biology students were taken on a field trip by their instructor Miss Barbara Manley and the supervisors of the Cherokee (S.C.) Soil Conservation District. Since then many students have written interesting articles about their tour. Excerpts from some of the papers follow.

The tour was an eye opener to Jean Spotts of Newberry and many of the others. "Last week my attitude toward conservation suddenly changed," she wrote, "I had never been on a tour of this kind before. In fact, I had never given too much thought to conservation. But now I find that conservation affects every part of our lives."

Martha Anne Floyd of Conway expressed it this way: "There were many things about our conservation tour that impressed me. While driving home this weekend I found myself watching the land and the way it was being used all the way home, something I had never done before."

The reaction of Ann Croom of Wilmington, N. C., was: "Since having gone on a conservation tour, I find myself automatically noticing the land and vegetation upon it. In contrast to eroded unproductive farms I see farms where all of the up-to-date conservation measures are practiced. Indeed, I breathe a sigh of relief when I realize that not all of South Carolina is washing away."

The sharing idea appealed to Mary Maner of Allendale: "Conservation is sharing. Sharing what we have today in natural resources with the generations of the future."

Beverly Timmons of Union says that she, for the first time, learned the facts of conservation. She wrote: "More important than any facts I learned, however, was that for the first time in my life I became aware that something had to be done now to conserve our water and soil, along with our other mineral and natural resources, if our Nation is to continue to prosper."

The pattern of conservation farming impressed Jo Ann Allen of Cherokee Falls: "The C. F. Swofford farm was really interesting—especially the strip-crop rotation. We flew over this farm during the spring holidays and it looked like a wide ribbon with many narrow stripes on it."

Frankie Sanders of Chester, probably remembering the drought of 1954 and her city's water dilemma, wrote of water: "Water can be converted from a destroyer of soil and plants to an aid to agriculture by terracing, use of grassed waterways, by drainage, pond construction, and irrigation systems."

Sylvia Cochran of Columbus, N. C. wrote: "I think there should be courses taught in all schools and colleges concerning the conserving of water and land and the best use of each."

Margaret Cudd of Mayo plugged SCS: "I have wondered why some streams are always muddier than others regardless of rainfall. Also, I know now why some farmers prosper more than others. When I ride along the highways now, I'll view the scenery with a different outlook. My respect for the Soil Conservation Service has reached a higher level."

Jackie Ray of Marion thinks progress is being made:



"More than ever before owners of land and operators of farms are becoming vitally interested in soil conservation."

Carol Knight of Summerville, one of the few farm girls on the tour, summed it up this way: "Since my dad operates a farm, the field trip was particularly interesting to me. I think he was a little impressed this weekend when I told him some of the things I had learned. My dad has his own conservation plan for our farm so I have always been aware of the importance of such a plan. But from this trip, I became, more than ever, aware of the need for a good soil conservation program."

—S. A. WOLFE

**SUCCESSFUL FISHWAY.**—The Fish and Wildlife Service announced recently that over 7,700 shad were passed upriver this year by the Holyoke fishway on the Connecticut River. This is the second year that substantial numbers of shad have ascended above the dam of the Holyoke Water Power Company. For 107 years previously the fish were denied access to a 30-mile stretch of their ancestral spawning grounds above this point.

Earlier this year the Holyoke Water Power Company was awarded the Conservation Service Award of the Department of the Interior for its cooperation in developing the new fishway.

## ACROSS THE SEA TO SUCCESS

(Continued from page 105)

He also believes that a complete farm conservation plan is basic and that it should be followed regardless of crop failures and other interruptions. He has learned from experience that you get nowhere by having a plan and then failing to follow it.

The buildings on the new farm were in poor condition and are located in one corner of the farm. Carl and Dick already have a good start on remodeling the house and plan on building a milk house soon. "The building of a new barn will have to wait until it can be paid for out of the earnings of the farm," Carl said.



**FORAGE CORPS.** By Gilbert H. Ahlgren. 2d edition. 536 pp. Illustrated. 1956. New York: McGraw-Hill Book Co., Inc. \$7.

**T**HIS book is well written and reflects Dr. Ahlgren's experience in teaching and research. It is broader in scope than the original edition. Over a hundred pages of new material has been added, either as new subject matter, or enlargements on the original information. New chapters include pasture and range management, conservation cropping, weed control, and forage mechanization.

The book clearly and concisely presents the basic principles of forage production. Important legumes and grasses are well treated, including adaptation, use, and management. Tables are effectively used to explain recent research findings. The author has cited many new references on the various phases of forage crop production as evidenced by the list of references at the end of each chapter.

The several chapters devoted to subjects common to all forages, includes seeding methods, seed mixtures, hay, silage, mineral nutrition, and seed production. These have been substantially enlarged and contain new material that was not available when the first edition was published in 1949.

The first few chapters dealing with the history, production, and use of forages, as well as the effect of soils and climate on the different species contain much more valuable information than the original edition.

This book will be valuable as a reference for agricultural workers, and is written in such a manner as to be useful as a college textbook. It should be especially useful to those east of the Rocky Mountains.

—B. D. BLAKELY